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FLIGHT MANUAL

LAK-17A mini Sailplane

Issue No. 1

Type:	LAK-17
Model:	LAK-17A
Variant:	LAK-17A mini
Serial Number:	_____
Registration:	_____
Date of Issue:	_____

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EASA TCDS No. EASA.A.083, Issue 08

This sailplane is to be operated in compliance with the regulatory information and limitations contained herein.

This Manual should always be kept on board of the sailplane

Chapter 0

0.1 Record of revisions

Any revision of the present manual, except actual weighing data, must be recorded in the following table and in the case of approved Chapters, endorsed by the responsible airworthiness authority.

The new or amended text in the revised page will be indicated by a black vertical line in the left hand margin, and the revision number and date will be shown on the bottom left hand of the page.

Rev. No.	Affected Chapter	Affected Pages	Date of Issue	Approval	Date of approval	Date of Insertion	Signature

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Chapter 1
GENERAL

Table of Contents

1.1 Introduction

The sailplane flight manual has been prepared to provide pilots and instructors with information for the safe and efficient operation of the *LAK-17A mini* sailplane.

This manual includes the material required to be furnished to the pilot by CS-22. It also contains supplemental data supplied by the sailplane manufacturer.

1.2 Certification basis

This type of sailplane has been designed in accordance with CS 22 Certification Specifications for Sailplanes and Powered Sailplanes, Amendment 2, 5 March 2009.

Category of Airworthiness: Utility.

1.3 Warnings, cautions and notes

The following definitions apply to warnings, cautions and notes used in the flight manual:

Warning	Means that the non-observation of the corresponding procedure leads to an immediate or important degradation of the flight safety.
Caution	Means that the non-observation of the corresponding procedure leads to a minor or to a more or less long term degradation of the flight safety.
Note	Draws the attention on any special item not directly related to safety by which is important or unusual.

1.4 Descriptive data

The *LAK-17A mini* is a modification of the single seat high performance sailplane of FAI 15 m – 18 m class LAK-17A designed according to CS-22, category "U" specifications. It is a mid-wing powered glider with flaps, T-tail, retractable main landing gear and 82 (optionally 134) liters [21.6 (optionally 35.4) US gal] water ballast.

The sailplane is made of hybrid composite materials (Kevlar, carbon and fiberglass). The wing spar is made of modern carbon rods (3.16 x 3.16 mm) and has a double T section. The airbrakes are located on the upper wing surface only. The wing airfoils are described in Table 1.4-1.

Table 1.4-1

s [m]	c [m]	Airfoil
13.5 m		
0.28	0.729	LAP 92-130/15mod
0.48	0.729	LAP 92-130/15
4.6	0.625	LAP 92-130/15
6.635	0.35	LAP 90-150/15

The cockpit is of monocoque construction. The manually controlled seat back and an adjustable head rest together with optimally arranged controls offer notable comfort for the long flights. The one piece Plexiglas canopy hinges forward. On the left side there is a sliding window for additional ventilation. The instrument panel folds up together with a canopy.

The retractable landing gear with shock absorbers has a 4.00-4" 8 PLY Tost Aero tire. The BERINGER main wheel brake is actuated by the lever on control stick, or via the airbrake control handle (optionally). The rudder pedals are adjustable in flight. All controls, including the water ballast system, hook up automatically or semi-automatically. Towing hooks are mounted: near the main landing gear (C.G. / winch / auto-tow hook) and/or in front of the pilot cockpit at the bulkhead (aero tow hook). Both towing hooks are operated by the same handle. The wings incorporate fork-type spar tips, joined with two pins.

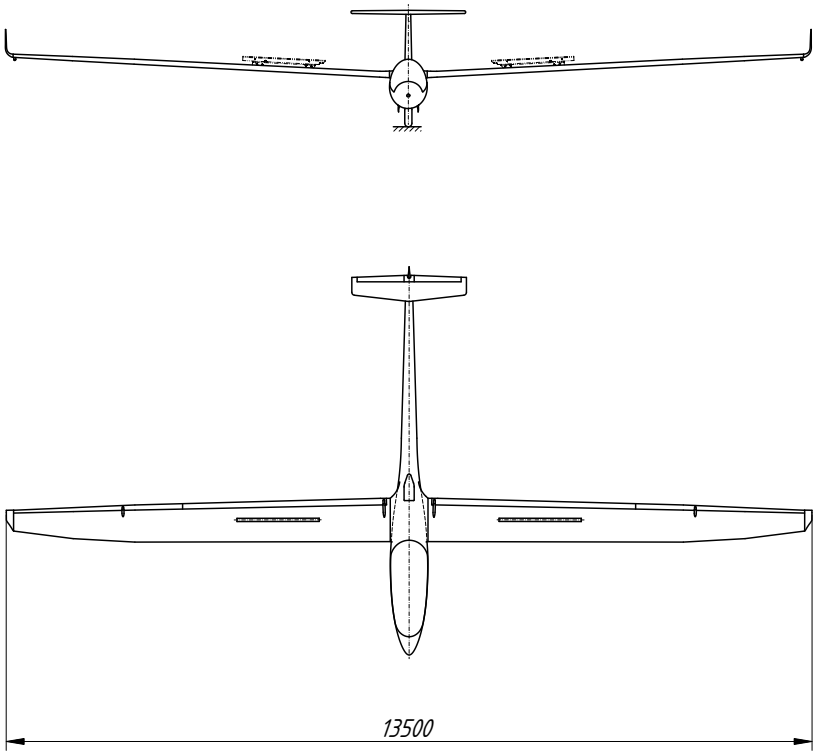
The T-tail (fixed stabilizer with elevator) of the *LAK-17A mini* provides stable and responsive pitch characteristics. The elevator hooks up automatically during assembly. The glider is fitted with a fin ballast tank of 8 ltr (2.11 US gal) capacity in order to adjust the optimum C.G. position. The antenna is mounted in the vertical fin.

Technical data of the *LAK-17A mini* sailplane is shown in Table 1.4-2.

Table 1.4-2

Wing span	13.5 m (44.29 ft)
Fuselage length	6.53 m (21.42 ft)
Height	1.32 m (4.33 ft)
Max gross weight	350 kg (771.6 lbs)
Mean aerodynamic chord	0.638 m (25.12 in)
Wing area	8.41 m^2 (90.52 ft^2)
Wing loading (minimum)	26.6 kg/m^2 (5.45 lbs/ft^2)
Wing loading (maximum)	41.61 kg/m^2 (8.52 lbs/ft^2)

1.5 Three-view drawing



1.6 Abbreviations

CAS	calibrated airspeed means indicated airspeed of a sailplane, corrected for position (due to position of pressure ports on sailplane) and instrument error. Calibrated airspeed is equal to true airspeed in standard atmosphere at sea level
C.G.	center of gravity
daN	decanewton
h	hour
IAS	indicated airspeed means the speed of a sailplane as shown on its pitot – static aircraft indicator and is uncorrected for the system error
m	meter
kg	kilogram
km	kilometer
s	second
ltr	liter

1.7 Unit conversion

1 bar = 14.5 pounds per square inch (psi);

1 decanewton (daN) = 2.25 pounds force;

1 kilogram (kg) = 2.2 pounds (lbs);

1 meter (m) = 39.4 inches (in.) = 3.28 feet (ft.);

1 millimeter (mm) = 0.0394 inches (in.);

1 liter = 0.2642 U.S. gal;

1 square meter (m^2) = 10.764 sq. ft;

1 kg/m^2 = 0.204 lbs / sq. ft;

1 m/s = 1.944 knots (kts);

1 km/h = 0.5396 kts;

1 kW = 1.34 HP.

Chapter 2
LIMITATIONS

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2.1 Introduction

Chapter 2 includes operation limitations, instrument markings and placards necessary for safe operation of the *LAK-17A mini* powered sailplane, its motor, standard systems and standard equipment.

The limitations have been approved. Compliance with these limitations is mandatory.

2.2 Airspeed

Airspeed limitations and their operational significance are shown in Table 2.2-1.

Table 2.2-1

Speed		IAS [km/h / (kts)]	Remarks
		13.5 m	
V_{NE}	Never exceed speed		Do not exceed this speed in any operation and do not use more than 1/3 of control deflection at:
		230 / (124) 220 / (119) 210 / (113) 195 / (105) 170 / (92)	0 – 4000 m (0 – 13100 ft) up to 5000 m (16400 ft) up to 6000 m (19680 ft) up to 8000 m (26250 ft) up to 10000 m (32800 ft)
V_{RA}	Rough air speed	170 / (92)	Do not exceed this speed except in smooth air and then only with caution. Rough air is in lee wave rotor, thunderclouds, etc.

Speed		IAS [km/h / (kts)]	Remarks
		13.5 m	
V_A	Maneuvering speed	170 (92)	Do not make full or abrupt control movement above this speed, because under certain conditions the sailplane may be over stressed by full control movement
V_{FE}	Maximum flap extended speed. Flap setting: -1 up to 0 +1 up to L	 230 / (124) 170 / (92)	Do not exceed these speeds with the given flap setting
V_W	Maximum winch and auto-tow launch speed	140 / (76)	Do not exceed this speed during winch or auto-tow-launching
V_T	Maximum aero towing speed	160 / (86)	Do not exceed this speed during aero towing
V_{LO}	Maximum landing gear operation speed	170 / (92)	Do not extend or retract the landing gear above this speed

Warning	At higher altitudes the true airspeed is higher than the indicated airspeed and V_{NE} is reduced with altitude.

2.3 Airspeed indicator markings

Airspeed indicator markings and their color code significance are shown in Table 2.3-1.

Table 2.3-1

Marking	IAS value or range [km/h / (kts)]	Significance
White arc	95...170 / (51...92)	Positive Flaps Operating Range: lower limit is 1.1 V_{SO} in landing configuration at maximum weight. Upper limit is maximum speed permissible with flaps extended positive.
Green arc	100...170 / (54...92)	Normal Operating Range: lower limit is 1.1 V_{S1} at maximum weight and most forward C.G. with flaps neutral. Upper limit is rough air speed.
Yellow arc	170...230 / (92...124)	Maneuvers must be conducted with caution and only in smooth air.
Red line	230 / (124)	Maximum speed for all operations
Yellow triangle	95 / (51)	Approach speed at maximum weight without water ballast

2.4 Mass (weight)

Maximum take-off mass of the *LAK-17A mini* is:

With water ballast	350 kg (771.6 lbs)
Without water ballast	350 kg (771.6 lbs)
Maximum landing mass	350 kg (771.6 lbs)

Note When landing on a rough and hard surface always dump all water ballast before landing.

Maximum mass of all non-lifting parts:	274 kg (604 lbs);
Maximum mass in baggage area:	7 kg (15.4 lbs).

Caution	Heavy pieces of baggage must be secured to the baggage compartment floor.

2.5 Center of gravity

Position of C.G. in flight:

front limit:	182 mm aft of wing root rib leading edge
rear limit:	305 mm aft of wing root rib leading edge

Warning	The sailplane may be safely operated only when loaded in the range defined in the Chapter 6 of this manual.

2.6 Approved maneuvers

This sailplane is certified for normal gliding in the "Utility" category according to CS-22. Aerobatic maneuvers are not permitted.

2.7 Maneuvering load factors

Limit load factors are:

for V_A = 170 km/h (92 kts) airspeed	+5.3 / -2.65
for V_{NE} = 230 km/h (124 kts) airspeed	+4.0 / -1.5
for V_{NE} = 230 km/h (124 kts), air brakes extended	+3.5 / 0
for V_F = 170 km/h (92 kts), flaps +1, +2, L	+4 / 0

2.8 Flight crew

LAK-17A mini is a single seat glider. Load in a pilot seat must be as follows:

Max load in the seat:	110 kg (242 lbs);
Min load in the seat:	see placard in cockpit and weighing report.

With these loads, the C.G. range given in 2.6 will be in the limits if the empty glider weight and C.G. is in the limits (see empty center of gravity chart in Chapter 6).

2.9 Kinds of operation

Flights must be conducted under Day / VFR conditions.

Cloud flying is not permitted.

Aerobatic maneuvers are not permitted.

2.10 Minimum equipment

As minimum equipment only the instruments and equipment specified herein and in the equipment list (see Maintenance Manual Section 2) are admissible:

- airspeed indicator, scale 50...300 km/h (27...162 kts), with range markings (see section 2.3);
- altimeter with altitude corrector and fine range pointer;
- four point symmetrical seat harness;
- power supply;
- outside air temperature (OAT) gauge (if water ballast is carried);
- emergency locator transmitter (ELT) (if required by national regulations);
- required placards, check lists and flight manual;

The minimum equipment must correspond with national regulations.

2.11 Aero tow, winch and auto tow launching

The maximum launch speeds are:

Aero-tow:	160 km/h (86 kts);
Winch / auto-tow launch:	140 km/h (76 kts).

For all of the above launching methods a weak link of 500 daN (1100 lbs) must be used in the launch cable or towrope.

For aero-tow, the length of the towrope must be at least 20 m (66 ft.).

Warning	For winch or auto-tow launch, only the C.G. hook can be used.

Warning	Aero-tow launches are only allowed at the aero-tow hook.

2.12 Other limitations

2.12.1 Crosswinds

The maximum demonstrated crosswind component according to the airworthiness requirements for take-off and landing is 15 km/h (8 kts).

2.12.2 Water ballast

Filling of the wing water ballast tanks must result in the symmetrical loading condition only. After filling, balance the wings by dumping enough water from the heavy wing to achieve lateral balance. Flight with leaking water ballast is not permitted as this may result in asymmetrical loading. For maximum permissible water ballast see section 6.9.

Warning	Flight with water ballast must be conducted at an OAT greater than +2 °C (36 °F). Otherwise jettison both wings and fin water ballast in order to prevent structural damages due to freezing of water.

Warning	Maximum take-off weight must not be exceeded.

2.13 Limitation placards

The following limitation placards are installed in a glider:

- Air speed data and loading placard in a cockpit:

LAK-17A mini – AIR SPEED DATA & LOADING PLACARD						
Speed IAS:		km/h	kts	**Masses and loads**	kg	lbs
Never exceed	V_{NE}	230	124	Max mass with/without water ballast	350	771.6
Rough air	V_{RA}	170	92	Maximum cockpit load	110	242
Manoeuvring	V_A	170	92	Minimum cockpit load		
Aerotow	V_T	160	86			
Winch-launch	V_W	140	76	Recommended weak link	500 daN	1100 lbs
Landing gear operation	V_L	170	92			
				Aerobatic manoeuvres are not permitted		

- High altitude flights V_{NE} limitations – on a right-side canopy rail, for the pilot in flight visible place:

m – **Altitude** – ft		km/h – **V_{NE} , IAS** – kts	
4000	13100	230	124
5000	16400	220	119
6000	19680	210	113
8000	26250	195	105
10000	32800	170	92

- Fin limitations placard:

Fin ballast
Max permitted 6.0 kg (13.2 lbs)

- Baggage weight limitation placard – located in a baggage area:

Max baggage weight
7 kg (15.4 lbs)

- Main wheel tire pressure limits – located on a main gear door:

Pressure in a main wheel tire
from 2.8 to 3.5 bar

- Tail wheel tire pressure limits – located next to the tail wheel:

Pressure in a tail wheel tire
from 1.8 to 2.0 bar

Chapter 3
EMERGENCY PROCEDURES

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3.1 Introduction

Chapter 3 provides a checklist and explanations for coping with emergencies that may occur. Emergency situations can be minimized by proper pre-flight inspections and maintenance.

3.2 Canopy jettison

The following steps accomplish canopy jettison:

1. Pull the red canopy jettison handle aft to the limit of its travel;
2. Release the handle.

The canopy jettison handle is located on the instrument panel and has an icon describing its function. A compression spring in the canopy hinge pushes the canopy upward and lets the airflow to lift the front of the canopy upward while the rear of the frame pivots about a small lip on the fuselage. This system is designed to lift the canopy up and away from the flying glider to allow the pilot a quick bailout from the cockpit.

If necessary, you have to push the canopy upwards with both hands on the Plexiglas.

Warning	The locking pin of the spring-type mechanism on the canopy hinge must be removed.

3.3 Bailing out

First jettison the canopy then unlock the safety harness and bail out. The low walls of the cockpit allow for a quick push-out exit.

It is recommended that bail out procedures be practiced on the ground at the beginning of each flying season.

3.4 Stall recovery

Stall recovery is accomplished by easing the stick forward and picking up a dropping wing with sufficient opposite rudder.

3.5 Spin recovery

Apply full opposite rudder against the direction of rotation and release the stick by 15-20 % from the aft position until the rotation stops. As the rotation stops centralize the controls and carefully pull out of the dive. The ailerons should be kept neutral during spin recovery.

Recovery from unintentional spins should be done immediately.

Caution	Altitude loss due an incipient spin from straight flight with prompt recovery is 80 m (262 ft.), increasing to 120-150 m (394-492 ft.) from circling flight and 150 m (492 ft.) to 180 m (590 ft.) with airbrakes extended. Maximum speed during recovery is 190-220 km/h (103-119 kts).

3.6 Spiral dive recovery

To recover from a spiral dive, apply rudder and aileron in the direction opposite to the spiral dive rotation and carefully pull out of the dive.

3.7 Recovery from unintentional cloud flying

At speeds below 170 km/h (92 kts), extend the air brakes fully. At higher speeds, up to V_{NE} , pull out the dive brakes very carefully and expect high aerodynamic forces and g-loads. Enter the descent and fly normally until leaving the cloud. When clear of the cloud, retract the dive brakes and reduce speed. Spins are not to be used to lose altitude.

3.8 Flight with asymmetrical water ballast

If you suspect that the water ballast is not dumping symmetrically you should close the dump valves immediately to avoid greater asymmetry. Asymmetry can be verified by the necessary aileron deflection in straight flight at low airspeeds.

When flying with asymmetric water ballast you must increase your airspeed, especially in turns, so that you can avoid stall at all costs. Should the aircraft enter a spin under these conditions, aggressive stick forward spin recovery will be necessary. Fly the landing pattern and touchdown with approximately 10 km/h (5.4

kts) faster than normal and after touchdown attempt to control the bank angle to avoid the heavy wing from touching the ground too early.

3.9 Emergency wheel up landing

An emergency wheel up landing is not recommended since the absorption capability of the fuselage is much smaller than that of the landing gear. If the landing gear cannot be extended the landing touchdown should be at slow speed.

3.10 Ground loop

If there is a risk of overshooting the landing area after touchdown an intentional ground loop may be initiated by forcing a wing tip to the ground and at the same time you should PUSH the stick forward to lighten the load on the tail wheel and apply the opposite rudder.

3.11 Ditching landing on water

Our experience shows that in ditching the cockpit area likely will be forced downward under water. Therefore an emergency landing on water is recommended only with the landing gear extended and then only as a last resort.

Make sure that all electricity is turned off before landing.

Chapter 4
NORMAL PROCEDURES

Table of Contents

4.1 Introduction

This chapter provides checklists and explanations of procedures for conducting normal operating procedures. Normal procedures associated with optional equipment can be found in Chapter 9.

4.2 Rigging and de-rigging, filling the water tanks

4.2.1 Rigging and de-rigging

The following procedures are recommended for rigging and de-rigging the *LAK-17A mini* sailplane:

1. Clean and lubricate all pins, bushings and control connections. Inspect the pins and bushings for burrs and gouges.
2. Support the fuselage and keep it upright, open the canopy and lower the landing gear. Place the control stick in the center of its travel. Position the dive brake handle near it most forward position, flaps handle in "-1" position. Put the water ballast control in the forward, closed position.
3. Be sure the air brake system in the wings is not locked. Remove any supports or locks over the ailerons.
4. Insert the left wing spar fork into the fuselage. As the wing root approaches the fuselage look to be sure the automatic hook ups for the aileron, flaps and dive brake properly engage. Look to see if the water ballast control is engaging correctly. After the wing is pushed into position support the wing tip.

Note	It's not allowed to rig or de-rig wings with the winglets installed.

5. Insert the right wing spar into the fuselage. As the wing root approaches the fuselage look to be sure the automatic hook ups for the aileron, flap and dive brake properly engage. Look to see if the water ballast control is engaging correctly. Line up the main pin bushings. Insert both spar pins fully. Lock the main wing pin handles.

Warning	Lock the main wing pin handles with fixing studs.

6. Install winglets and lock.
7. Install the fin batteries.
8. Slide the stabilizer onto the drive pins and look to make sure the automatic hookups for the elevator properly engage. Push the stabilizer all the way onto the drive pins. Screw the locking bolt in and make sure, that the bolt is fixed. After removing the assembly tool, place a piece of glider tape over the locking bolt.

Warning	Fin batteries must be installed.

Warning for serial numbers up to 017	For de-rigging, before unscrewing mounting bolt, unfix it by pulling out locking pin.

9. Apply sealing tape to the wing/fuselage gaps.
10. Perform a positive control check for all controls.
11. Install total energy tube and temporary equipment (battery packs, barographs etc.)
12. Perform Daily Inspection.
13. De-rigging follows the reverse order of rigging. Confirm that water ballast has been dumped before de-rigging. Also see Section 3 of the “Maintenance Manual”.

Note	Remove horizontal stabilizer before removing the wings.

4.2.2 Filling the water tanks

If water ballast is necessary, fill each wing tank according to the loading chart (see Chapter 6) and confirm symmetrical loading by balancing at the wing tip. Wing ballast is filled through the hole on the top side of the wing. A light coating of

waterproof grease applied to the dump valve seat will help insure the valve is leak free and opens smoothly.

Fin water ballast is filled through the filling opening at the top of the fin. This can be done with or without stabilizer installed. Fill fin tank according to the loading chart (see Chapter 6).

Warning	Allow tanks to vent while filling. Do not fill with pressure exceeding 1 psi / 0.06 bar as the structure could be damaged. Check for proper dump valves operation prior to flight. Do not exceed the maximum gross weights.

4.3 Daily inspections

Please keep in mind the importance of the inspection after rigging the glider and respectively each day prior to the first take off. As a minimum check the following items. If any problems are found they must be corrected before flying.

1. Airworthiness documents, placards and markings;
2. Check fore-part of the fuselage;
3. Check the pilot cockpit:

- cockpit area for lose objects or damaged components;
- the pilot cockpit canopy glass;
- operation of pilot cockpit canopy lock, canopy jettison system;
- unlock canopy jettison system if locked;
- wings connection pins locked;
- operation of towing hook(s);
- operation of water ballast system;
- operation of control systems: ailerons, flaps, elevator, rudder and airbrakes (confirm that air brakes lock when closed);
- operation of cockpit ventilation, seat back adjustment;
- operation of a trimmer;
- batteries and oxygen bottle for condition, properly secured;

- operation of flight instruments (especially pneumatic);
- radio communication;
- safety belts;

4. Check main and tail wheel tires pressure and operation of the main wheel brake;
5. Check the left wing:

- upper and lower wing surfaces;
- leading edge;
- upper and lower surfaces of ailerons and flaps;
- deflections of ailerons and flaps and their clearances;
- airbrakes for proper function and locking;
- ailerons and flaps attachment to the wing;
- clearance between the wing and the fuselage;
- winglets installed, locked and secured;

6. Check function of control systems (of an ailerons, flaps, airbrakes), their connections to corresponding control systems in the fuselage;
7. Check the fuselage exterior surface;
8. Check a stabilizer, an elevator and a rudder:

- surfaces;
- deflections and clearances of controls;
- fixing of joint of the stabilizer attachment to the fin;
- clearance of the stabilizer with respect to the fin;

9. Check the right wing (same as for the left wing according to point 5);

Caution	After a hard landing or if high loads have been experienced, a complete inspection according to the Maintenance Manual Section 5.5 must be performed. Contact the manufacturer for assistance if required.

4.4 Pre-flight inspection

1. Main spar pins installed and locked;
2. Controls checked for operation and freedom of movement;
3. Lead or water ballast for underweight pilot installed or filled;
4. Tail dolly removed;
5. Unlock canopy jettison system if locked;
6. Batteries and oxygen bottle installed, properly secured;
7. Pilot safety harness connected and properly adjusted / tightened;
8. Seat back and rudder pedals adjusted. **Seat back properly fixed!**
9. All control knobs within reach;
10. Water ballast checked, dump valve closed and vents open;
11. Airbrakes closed and locked;
12. Trim set to take-off position;
13. Flaps set to take-off position;
14. Check wheel brake;
15. Altimeter set correctly;
16. Check direction of wind component;
17. Close and lock canopy;
18. Max mass not exceeded.

4.5 Normal procedures and recommended speeds

Normal flight operation procedures and the corresponding recommended air speeds are as follows.

4.5.1 Aero-tow launch

Before taking off adjust the flaps to the “-1” position. When the speed V = 50 km/h (27 kts) is reached or when it is felt that the ailerons have sufficient effectiveness,

adjust the flaps to the “+2” position and simultaneously gently push the stick forward.

When aero-towing in higher turbulence, sailplane must be in the axis of the or higher than the towing plane, to facilitate the control of the flight. When aero-towing in smooth air: being on the right, left, higher or lower sides of the towing plane, does not impede the control of the sailplane.

When aero-towing in a crosswind it is recommended to park the sailplane approximately two meters on the left or right side from sailplanes axis to the side of the wind.

Warning	Aero-tow launches are only allowed at the aero-tow hook.
Warning	When water tanks are partially filled, keep wings horizontal before take-off to avoid uneven water distribution.

Weak link in tow cable: max 500 daN (1100 lbs). Use wheel brake during tightening of tow cable to avoid rolling over tow cable.

Minimum aero-tow speed:

Without water ballast	120 km/h (65 kts);
With water ballast	125 km/h (67 kts).

4.5.2 Winch-launch or auto-tow

Adjust trimmer to neutral. Flaps in the “+1” position.

When V = 90 km/h (49 kts) is reached slowly increase the angle and gain altitude at speed V = 110 ÷ 125 km/h (59 ÷ 67 kts).

Caution	Do not decrease the speed up to V = 100 km/h (54 kts) because the auto-release mechanism on the hook will function.

When there is no thrust of the winch, push the stick forward and release the cable.

Warning	For winch or auto-tow launch, only the C.G. hook can be used.
Warning	It is prohibited to use the aero-tow hook for winch or auto-tow launches.
Warning	When water tanks are partially filled, keep wings horizontal before take-off to avoid uneven water distribution.
Warning	Seat back and pedals must be properly fixed!

Weak link in tow cable: max 500 daN (1100 lbs). Use wheel brake during tightening of tow cable to avoid rolling over tow cable. Pronounced forward stick pressure is required during transition arc.

Minimum winch-launch speed:

Without water ballast	110 km/h (59 kts);
With water ballast	120 km/h (65 kts).

4.5.3 Free flight

Circling flight (thermalling) with flaps position "+2", stick forces to zero. Best gliding ratio is between 90 and 100 km/h (48 and 54 kts).

For high speed flight up to 230 km/h (124 kts) position flaps between "0" and "-1" according to speed.

Due to flap control forces, flaps position "+2" may not be set above 170 km/h (92 kts).

Recommended flaps positions are shown in Table 4.5-1.

Table 4.5-1

Flap position	Speed, km/h / (kts)	
	without water ballast	with maximum take-off weight
L	80...100 / (43...54)	90...110 /(49...59)

Flap position	Speed, km/h / (kts)	
	without water ballast	with maximum take-off weight
+2	100...150 / (54...81)	100...150 / (54...81)
+1	110...150 / (59...81)	110...150 / (59...81)
0	140...220 / (75...118)	140...220 / (75...118)
-1	≤230 / (124)	≤230 (124)

4.5.4 Low speed flight and stalling behavior

The *LAK-17A mini* behaves normally in slow and stalled flight.

With a forward C.G. position is a clear and distinct stall warning. The stall characteristics are very gentle and large aileron deflections can be applied without dropping the wing.

At rearward C.G. positions airflow separation over the fuselage results in buffeting and gives warning to an impending stall.

Full and sudden aileron or rudder deflections will result in a spiral dive, spin entry or slide slip depending on the C.G. position.

Caution	Altitude loss due to an incipient spin from straight flight with prompt recovery is no less than 80 m (262 ft), increasing for circling flight.

4.5.5 Approach and landing

Recommended flaps position is “L” (landing).

In light winds and without water ballast the approach to landing should be flown at about 95 km/h (51 kts). Stronger winds require increased airspeeds. The very effective dive brakes make a short landing possible, however, do not approach too slowly with fully extended dive brakes as the aircraft may drop during the flare out. The glider should touch down on the main and tail wheel. The main wheel brake can then be applied for a shortened ground roll. When flying with inside - slip with airbrakes extended vibrations of the sailplane occurs. The control stick

should be in aft position. Due to side-slip control force decrease or reversal is possible.

Caution	There is a light tendency to “go on the nose” while braking after landing, especially with heavy pilots.

4.5.6 Flight with water ballast

Flight in excess of the maximum gross weight 350 kg (771.6 lbs is prohibited. The maximum amount of water allowed depends on the empty weight of the sailplane combined with the total cockpit load (see section 6.9).

Warning	Flight with water ballast must be conducted at an OAT greater than +2 °C (36 °F). If there is a risk of freezing temperatures, all water ballast, including fin water ballast must be dumped before freezing temperatures are reached. The flight conditions must comply with the Table 4.5-2

Table 4.5-2

Ground temperature	C°	10	15	20	30	40
	F°	50	59	68	86	104
Max. flight altitude	m	1200	2000	2700	4300	5800
	ft	4000	6500	9000	14000	19000

Filling and dumping the water ballast:

After filling the ballast tanks, either full or with partial loads, the wings should be leveled and checked for symmetrical loading. Flight with leaking ballast valves is prohibited. Open ballast valves fully to dump water ballast.

A time to drain water ballast tanks:

- wing tanks ~3 ÷ 4 min;
- tail tank ~ 1 min 30 sec.

Warning	A filling ballast tank with pressurized water is prohibited. Always allow space for the displaced air to escape.

4.5.7 High altitude flights

Indicated airspeed readings are progressively under-stated of true airspeed with higher altitudes. The limitations apply to high altitude flights as indicated at the placard given in a section 2.14 of this manual.

Special care should be taken to ensure that there is no moisture on any section of the control junctions that could lead to freezing at high altitudes.

4.5.8 Flight in rain

With light rain the stall speed and sink rate increase slightly, therefore landing approach speeds in rain must be increased. Rainwater on wings should be removed before take-off. Do not fly into icing conditions with a wet sailplane.

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Chapter 5
NORMAL PROCEDURES

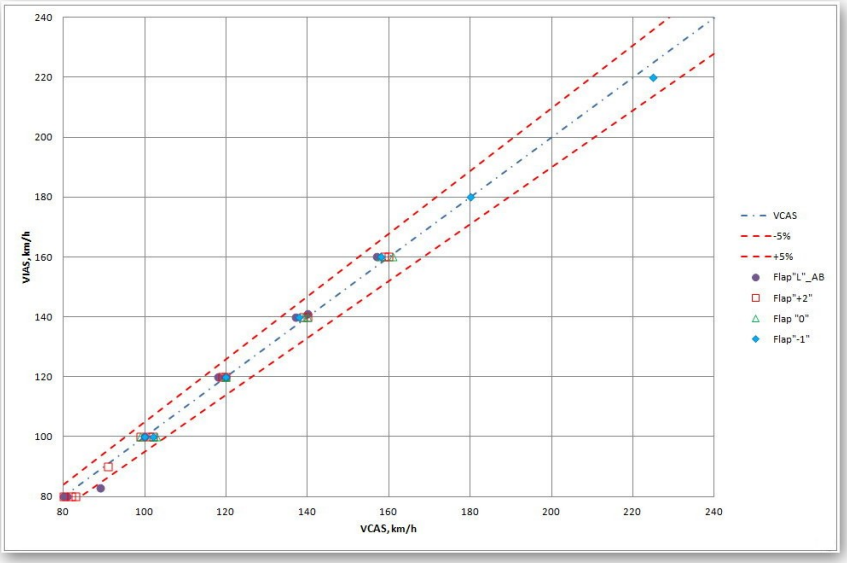
Table of Contents

5.1 Introduction

This Chapter provides EASA approved data for airspeed calibration, stall speeds and take-off performance and non-approved further information. The data in the charts have been computed from actual flight tests with the sailplane in good condition and using average piloting techniques.

5.2 Data approved by EASA

5.2.1 Airspeed indicator system calibration



Caution	The airspeed indicator is to be connected to the pitot source from the fuselage nose and static source from the aft fuselage part.

Color coding of the plastic tubing is as follows:

- red – pitot;
- yellow – tail static;

- TE tube – green.

5.2.2 Stall speeds

Stall speeds for different sailplane configurations are shown in Table 5.2-1.

Table 5.2-1

Flap position	Stall speed in level flight, km/h (kts)	
	without water ballast	with maximum take-off weight
L	80 (43.2)	83 (44.8)
+2	82 (44.2)	85 (45.9)
+1	83 (44.8)	87 (47)
0	84 (45.3)	90 (48.6)
-1	85 (45.9)	95 (51.3)

The loss of altitude for wings level stall recovery is approximately 30 m (100 ft) if recovery is immediate.

The loss of altitude for turning flights stall recovery is up to 50 m (164 ft) if recovery is immediate.

5.3 Additional information

5.3.1 Demonstrated crosswind components

The demonstrated crosswind velocity is 4.16 m/s (15 km/h) (8 kts.), according to the airworthiness requirements.

5.3.2 Glide performance

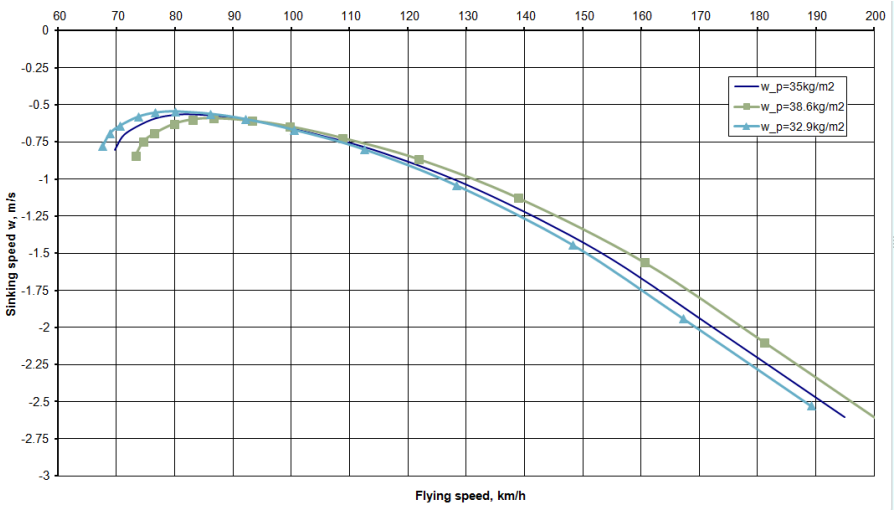
Data evaluated by comparison flights.

For optimum performance the aircraft should be flown with a C.G. position between medium and the rear of the allowable range. However, the aircraft will be more pitch sensitive at aft C.G. positions.

The wing fuselage joint and the tail plane locking pin should be taped over and the aircraft thoroughly cleaned to obtain maximum performance.

The polar apply to a clean aircraft, motor stopped. With dirty wings or flight in rain the performance drops accordingly.

5.3.3 Flight polar



Chapter 6
WEIGHT AND BALANCE / EQUIPMENT LIST

Table of Contents

6.1 Introduction

This Chapter contains the payload range within which the sailplane can be safely operated. Procedures for weighing the sailplane and the calculation method for establishing the permitted payload range are also provided. A comprehensive list of all equipment available for this sailplane is contained in the Maintenance Manual.

6.2 Weighing procedures

The Weight and Balance Report for the *LAK-17A mini* must be calculated in accordance with the currently valid weighing data. The weighing must be established as shown in Figure 6.2-1.

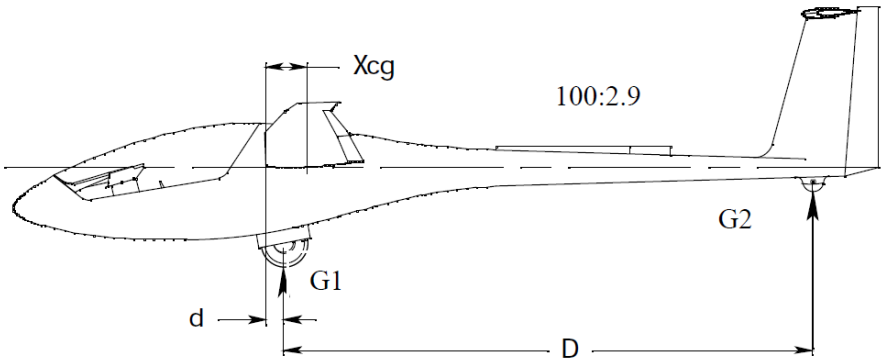


Figure 6.2-1

6.3 Weighing record

The result of each C.G. weighing is to be entered in the Weight and Balance Report in Chapter 6.4. The current minimum cockpit load must also be entered on the cockpit placard. When adding or changing instruments or equipment the new weighing report may be produced by a C.G. calculation using the following formula:

$$X_{CG} = \frac{G2 \cdot D}{G1 + G2} + d \text{ , mm}$$

6.4 Empty weight and C.G.

Approved in flight C.G. positions are shown in Table 6.4-1.

Table 6.4-1

No.	Parameter	Approved limit, mm
In flight:		
1	Foremost position of C.G.	182
2	Rearmost position of C.G.	305

Table 6.4-2

Weight and balance record

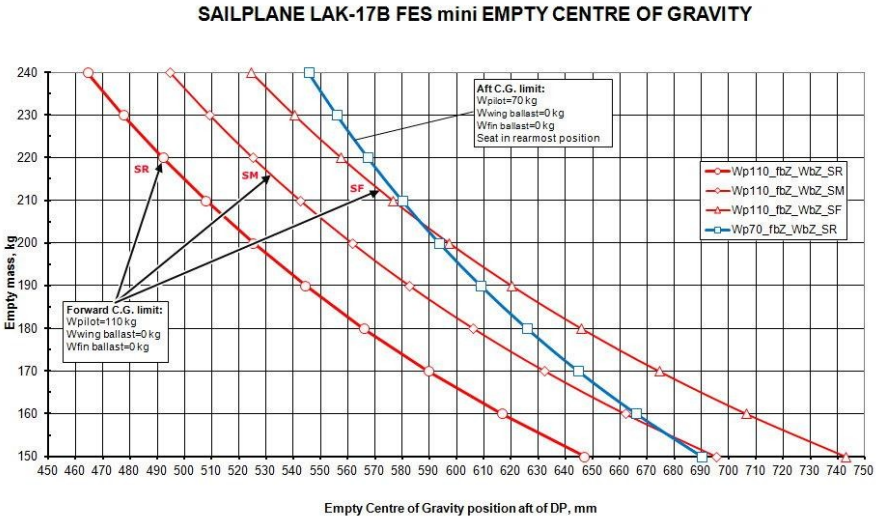
Date	Empty weight of the sailplane [kg]	C.G. location [mm]	Approved	
			Date	Signature

Date	Empty weight of the sailplane [kg]	C.G. location [mm]	Approved	
			Date	Signature

Empty weight center of gravity of the *LAK-17A mini* is defined for the 13.5 m wing configuration, water ballast tanks empty, glider ready to fly, excluding weight of pilot and parachute.

Warning	Due to flutter reasons it is not allowed to add additional masses to the fin battery or the fin battery compartment.

The permissible range of empty glider center of gravity is given below:



SR – seat in rearmost position; SM – seat in middle position; SF – seat in foremost position.

6.5 Calculation of C.G. position

Center of gravity position after loading glider (additional instruments, equipment, water ballast, pilot) is defined as:

$$X_{CG} = \frac{\sum_n G_n \cdot X_n}{\sum_n G_n}, \text{ mm}$$

where:

G_n – the glider component mass, kg;

X_n – distance between glider component mass C.G. and wing root leading edge, mm; distance is negative if mass C.G. is ahead of the wing root leading edge; distance is positive if mass C.G. is behind of the wing root leading edge;

n – number of glider components;

$\sum_n G_n$ – sum of all glider components masses;

$\sum_n G_n \cdot X_n$ – sum of moments of all glider components masses.

Table 6.5-1

The C.G. calculation table

No	Component	Weight G_n [kg]	Distance X_n [mm]	Moment $G_n \cdot X_n$ [kg · mm]
1	Empty glider*			
2	Pilot	110	-504	
3	Battery in fin	3.5	4192	
4	Battery on landing gear box	2.6	64	
5	Battery in fuselage (under instrument panel)		-1055	
6	Water ballast in wings (y = 316 – 2900)		174	
7	Water ballast in wings (y = 2900 – 4600)		181	
8	Water ballast in fin		4005	
9				
10	Instrument N1 in instrument panel		-1010	
11	Instrument N2 in instrument panel		-1010	
12	Oxygen Cylinder and fixing		350	
13				
14				
15				
16				
17				
18	Removable ballast in the fin		4329	
19	Removable front ballast		-1785	

No	Component	Weight G_n [kg]	Distance X_n [mm]	Moment $G_n \cdot X_n$ [kg · mm]
20	Baggage weight		150	
	ΣG_n =		**$\Sigma G_n \cdot X_n$ =**	

* – these data for columns *Weight* G_n and *Distance* X_n should be taken from current "Weight and balance record" table (paragraph 6.4) as G_n = "Empty weight of the sailplane" and X_n = "C.G. location".

Note	The glider empty weight and empty weight center of gravity are defined by weighing data.

- Pilot: actual pilot weight with parachute:
  - distance X = -505 mm, when pilot seat is in the rearmost position;
  - distance X = -570 mm, when pilot seat is in the middle position;
  - distance X = -635 mm, when pilot seat is in the foremost position.
- Water ballast in wings: actually filled water ballast weight.
- Water ballast in a fin: weight of actually filled water ballast in to the fin tank.
- Baggage weight: weight of baggage in a baggage compartment weight.

6.6 Weight of all non-lifting parts

Weight of non-lifting parts of the sailplane includes weight of pilot, fuselage, stabilizer with elevator, rudder, instruments and equipment. Maximum weight of non-lifting parts of the *LAK-17A mini* is 277.4 kg (611.5 lbs).

6.7 Maximum weight

The maximum approved take-off and landing weight is 350 kg (771.6 lbs).

6.8 Useful loads

The maximum useful load of the *LAK-17A mini* is equal to the maximum approved take-off and landing weight minus the empty weight of the aircraft plus the weight of any added water ballast.

6.9 Water ballast loading table

The max permissible water ballast weight [kg] is given in the following table.

Table 6.9-1

Wing span: 13.5 m; Sailplane maximum take-off mass: 350 kg

Mass of pilot with parachute	Sailplane empty weight, kg +fin water ballast weight, kg																		
	150	155	160	165	**170**	**175**	**180**	**185**	**190**	**195**	**200**	**205**	**210**	**215**	**220**	**225**	**230**	**235**	**240**
70	130	125	120	115	110	105	100	95	90	85	80	75	70	65	60	55	50	45	40
75	125	120	115	110	105	100	95	90	85	80	75	70	65	60	55	50	45	40	35
80	120	115	110	105	100	95	90	85	80	75	70	65	60	55	50	45	40	35	30
85	115	110	105	100	95	90	85	80	75	70	65	60	55	50	45	40	35	30	25
90	110	105	100	95	90	85	80	75	70	65	60	55	50	45	40	35	30	25	20
95	105	100	95	90	85	80	75	70	65	60	55	50	45	40	35	30	25	20	15
100	100	95	90	85	80	75	70	65	60	55	50	45	40	35	30	25	20	15	10
105	95	90	85	80	75	70	65	60	55	50	45	40	35	30	25	20	15	10	5
110	90	85	80	75	70	65	60	55	50	45	40	35	30	25	20	15	10	5	0

Maximum capacity of wing tanks: 134 liter (35.40 US gal):

wings (316 ÷ 2900): 82 liter (21.66 US gal);

wings (2900 ÷4600) optionally: 52 liter (13.74 US gal).

Maximum capacity of fin tank: 8 liter (2.11 US gal).

6.10 Determining possible loading of the glider

The allowed fin water ballast depending on a pilot weight must be calculated (use *LAK-17A_mini_CG_calculator.xls*).

Fin water ballast is only usable to compensate the pilots moment.

Warning	It is not allowed to use the fin water ballast to bring back a heavy pilot into the allowed C.G. range. In that case jettisoning the fin water ballast will cause a C.G. position out of the allowed range.

The example how to determine possible loading of the glider:

Sailplane empty weight:	220 kg;
Empty weight center of gravity:	510 mm;
Pilot with parachute weight:	80 kg;

According to the graph "*Sailplane LAK-17A mini empty center of gravity*", the empty weight C.G. is in permissible range.

According to the "*Water ballast loading table*" – the max permissible wing water ballast weight is 50 kg.

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Chapter 7
SAILPLANE AND SYSTEMS DESCRIPTION

Table of Contents

7.1 Introduction

This Chapter provides a description of the sailplane, its systems and provided standard equipment with instructions for use.

7.2 Airframe construction

The *LAK-17A mini* is a single seat high performance sailplane designed to meet CS-22 requirements. The wings are constructed with glass and carbon fiber reinforced plastic over a plastic foam core with carbon rod spar caps. The ailerons are made of carbon fiber reinforced plastic. The fuselage is made using glass fiber reinforced plastic with Kevlar and carbon for local stiffness. The stabilizer, elevator and rudder are glass fiber reinforced plastic over plastic foam core.

Cockpit layout description is given below (see Figure 7.2-1, Figure 7.2-2, Figure 7.2-3):

1. Seat back adjustment handle.
2. Trim control handle.
3. Flaps control handle.
4. Airbrakes control handle with optional wheel brake control.
5. Tow release knob.
6. Canopy latching handle.
7. Cockpit ventilation knob.
8. Canopy jettison handle.
9. Instrument panel.
10. Rudder pedals.
11. Landing gear control handle.
12. Water ballast control handle.
13. Rudder pedals control handle.
14. Tail water ballast control handle.
15. Side pocket.
16. Control stick.
17. Safety harness.
18. Wheel brake lever.

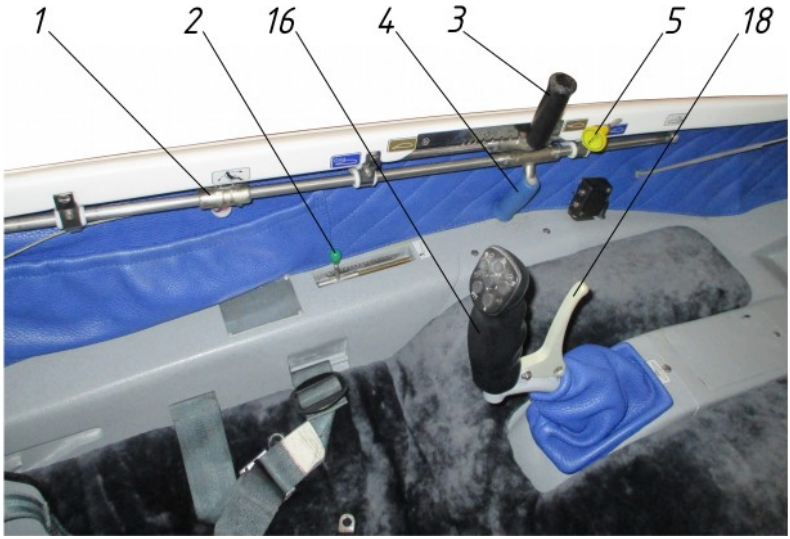


Figure 7.2-1

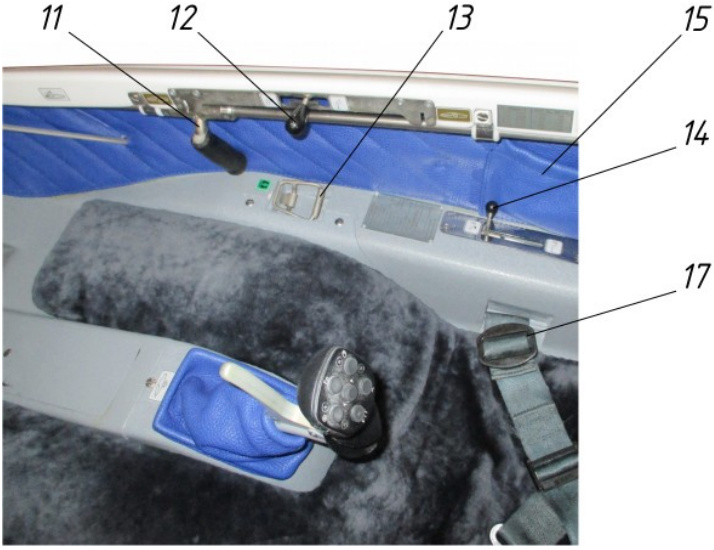
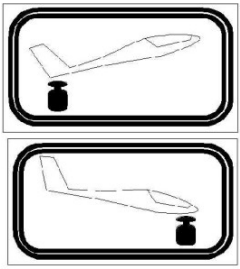


Figure 7.2-2

Figure 7.2-3

7.3 Flight controls and trim

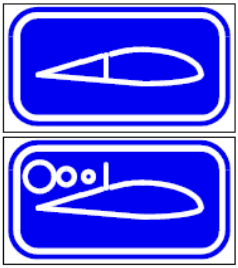
The ailerons and elevator are operated from the central control column (control stick).



The trim adjustment control knob is located in *the left armrest* and controls the elevator trim select position. See Maintenance Manual Section 2. To set the trim, simply move the adjustment knob to the desired trim position.

The rudder pedals control the rudder by a cable system and are adjusted using the gray knob located in the right armrest. Pull the knob to loosen the rudder pedal lock, make the adjustment, and release the knob to lock the rudder pedals in the desired position.

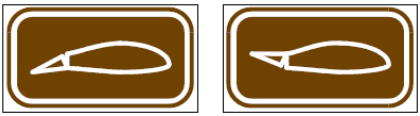
7.4 Airbrakes and wheel brake



The airbrakes are operated by the blue control handle located on the left cockpit wall. Pull the handle back to extend the airbrakes and push forward to retract and lock.

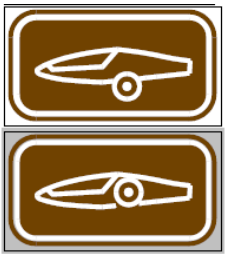
The wheel brake is actuated by the lever on the control stick. See Maintenance Manual Section 2.

7.5 Flaps



The flaps are operated by the gray control handle located on the left cockpit wall. For more information see Maintenance Manual Section 2.

7.6 Landing gear

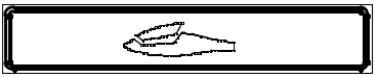


The landing gear is extended and retracted with the gray control handle located in the right hand armrest. Landing gear locked positions are located at either end of the control handle travel. Forward to extend, back to retract. The system is assisted by a nitrogen gas strut. See Maintenance Manual Section 2.

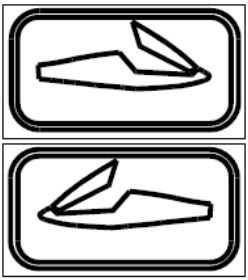
7.7 Tow release

The tow release is the yellow control knob located at the left side wall of the cockpit. Pull this control knob to open the tow release and release the knob to allow the tow coupling to snap closed and lock.

7.8 Canopy operation

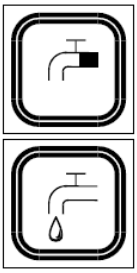


To jettison the canopy pull the red canopy release handle firmly back and release it. A spring will push the front of the canopy up. This allows the airflow to lift it up and carry it away.

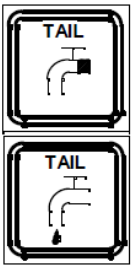


The canopy latching handles are black and are located on either side of the canopy frame. Pull the handles back to lock and push forward to un-lock. Never use the window opening to lift or lower the canopy. Cracks in the canopy will result. When sitting in the cockpit use the small tabs on the frame to raise and lower the canopy.

7.9 Water ballast system



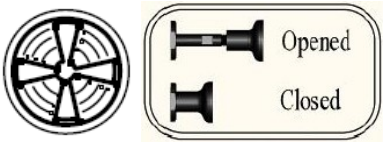
The wing water ballast valves control knob is located on the right side of the cockpit wall. To open the dump valves move the knob to the back and to close the dump valves move the knob forward.



The sailplane has an independent control system for the fin tank valve - the water ballast valve control knob of the fin tank is located on the right side of the cockpit wall. To open the dump valve move the knob to the back and to close the dump valve move the knob forward.

See Maintenance Manual Section 2.

7.10 Cockpit ventilation



The canopy de-mist vent control is located on the instrument panel. Pull to open, push to close.

7.11 Seat back adjustment

Seat back adjustment is accomplished by using the squeeze ring located on the left cockpit side.

7.12 Baggage compartment

Hard objects cannot be carried in the baggage compartment without a suitably designed lashing or anchorage. The baggage compartment load must not exceed 7 kg (15.4 lbs).

7.13 Safety harness

A safety harness with four fixed attachment points is provided.

7.14 Pitot and static pressure system

The fuselage-mounted tubes provide the pitot and static pressure.

Warning	An air leak will adversely affect airspeed indication and other instruments. Make sure the probe is fully seated in the receptacle for proper operation.

See Maintenance Manual Section 2.

7.15 Miscellaneous equipment

7.15.1 Oxygen system

The oxygen system (Aerox Oxygen, type C, D or M) must be operated in accordance with the instructions provided by the manufacturer (Aerox Oxygen, type C, D or M) of the system.

Caution	Installation of the oxygen system (Aerox Oxygen, type C, D or M) must be accomplished by the aircraft manufacturer or by a certified aircraft mechanic, according to national rules and regulations. An authority aircraft inspector must approve the installation.

7.15.2 Emergency locator transmitter

The system must be operated in accordance with the instructions provided by the manufacturer of the Emergency Locator Transmitter system. See the Maintenance Manual, Section 2, for recommended installation places.

Caution	Installation of the Emergency Locator Transmitter must be accomplished by the aircraft manufacturer or by a certified aircraft mechanic, according to National rules and regulations. An authority aircraft inspector must approve the installation.

7.16 Radio transceiver

Any of approved radio station types should be used (Becker, Filser or similar).

7.17 ACL system

The sailplane LAK-17A mini has the anti-collision lights (Further – ACL) system installed. For more detailed information about ACL systems components refer to sailplane's Maintenance Manual.

System usage description

The ACL system switch has 3 positions:

- Position "Upwards". Used for manual mode. The ACL system starts working immediately and only shuts down when the pilot decides to.
- Position "Neutral". The ACL system is not working and is switched off.
- Position "Downwards". Used for automatic mode. The ACL system starts working only when instructed to do so by the FLARM system, which detects other aircraft in the air space and the possibility of collision occurs.

Preparation of ACL system for work

1. Turn on the “MAIN SWITCH” on the instrument panel;
2. Turn on the ACL control switch “upwards” or “downwards” according to the decision, taken by the pilot.

Preparation of ACL system for flight

1. Check the battery charge level. The batteries must be charged up to voltage V = 13.4 Volts.
2. Check the ACL module casing, the absence of mechanical fractures and irregularities, transparency, humidity under the casing and possible humidity appearance.
3. Check the ACL module light diodes by turning on the “MAIN SWITCH” and the ACL control switch to manual mode (position “downwards”). Make sure that the LED indicator on top of the switch is working and the ACL module is working with a frequency of 72 Hz.
4. After the inspection, turn off until usage during the flight.
5. Remove the found defects.

Corresponding placards

Located near the ACL light switch.

Located near the ACL system circuit breaker.

Chapter 8
SAILPLANE HANDLING, CARE AND MAINTENANCE

Table of Contents

8.1 Introduction

This chapter contains the manufacturer's recommended procedures for proper handling and servicing of the sailplane. It also identifies certain inspection and maintenance activities, which are needed to retain performance and dependability.

8.2 Inspection periods and maintenance

The Instructions for Continued Airworthiness as provided in the *LAK-17A mini* Maintenance Manual must be followed. Before each rigging, all connecting pins and bushings should be cleaned and greased. Also, at least once a year the control surface displacements and adjustments must be inspected to insure conformity with factory data. See the *LAK-17A mini* Maintenance Manual for additional information.

8.3 Alterations and repairs

It is essential that the responsible airworthiness authority be contacted prior to any major alterations on this sailplane to ensure that the airworthiness is not impaired. Major alterations without approval from the manufacturer are prohibited. Furthermore, the manufacturer will not be held liable for unapproved alterations or for damages resulting from changes in the characteristics of the aircraft due to these alterations. External loads from camera installations are to be regarded as major alterations. Repair instructions are located in the Maintenance Manual Section 8. No repair should be performed to this aircraft without referring to Maintenance Manual. When in doubt as to the suitability of a repair contact the manufacturer.

Caution	No additional color marking on the white upper surface is allowed.

8.4 Tie down

The recommended tie down points are the tow release, wing tips and fuselage tail just ahead of the vertical fin. The cockpit always must be closed and covered when tied down.

8.5 Sailplane trailer

A sailplane of this quality and value should be transported and stored in a high quality enclosed trailer constructed of metal or fiber glass reinforced plastics. Proper ventilation and UV blocking characteristics should be provided. The wings should be supported as close as possible to the inner most root rib and again at a point one third from the wing tip. The horizontal stabilizer may be stored vertically or horizontally. The fuselage should be supported in a fuselage dolly positioned just forward of the main landing wheel opening. Due to the angle of the fuselage in the trailer a forward stop must be provided for the fuselage dolly. Otherwise it will roll forward and leave the fuselage with no support. Forward and aft motion of the fuselage should be restricted with a felt lined nose cone support and a tail wheel well with a fuselage strap located just forward of the vertical fin.

Caution	For fuselages forward and jumping motion of the fuselage restriction could be arranged with a nose cone support in shape of spinner with a big enough recess for propeller blades in horizontal position, covered with a soft thick material.

It is recommended to use soft cotton canopy cover which goes also around spinner nose of sailplane, which then also prevents opening of propeller blades. If canopy cover is not used then propeller blades should have fitted a cover with elastic, which also prevent opening of propeller blades.

8.6 Ground handling

Ground towing should be accomplished using the tow release and standard double aero tow ring. Ground towing should also be accomplished with a tail dolly tow bar and wing tip wheel.

8.7 Cleaning

The exterior painted surfaces should be cleaned with clear water using a sponge or soft cotton towel and chamois. These surfaces should also be protected with a silicone free hard wax reapplied at least once a year by hand or with a rotating cloth disc. Tape adhesives are best removed using pure petroleum spirits or wax containing a light polishing agent. Do not clean the exterior surfaces with alcohol, acetone or lacquer thinner.

Clean the Plexiglas canopy only as necessary using a soft cotton towel and clear water mixed with a small amount of mild detergent. Protect the canopy with anti-static cleaning agents which are made specifically for Plexiglas.

All non-painted metal surfaces must be regularly wiped clean and protected with a light coating of grease.

Tape adhesives are best removed using pure petroleum spirits or nitro thinner.

Chapter 9
SUPPLEMENTS

There are no supplements